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Notes on a Herpetological Collection from Oaxaca

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In 1944 Dr. Walter S. Miller spent several weeks in the region about Mt. Zempoaltepetl in Oaxaca, Mexico, a region relatively little known to biologists. Engaged chiefly in ethnological studies, Dr. Miller secured but few herpetological specimens. These are, however, of unusual interest, and with the kind permission of Dr. Miller, Dr. Alexander Wetmore and Dr. Doris Cochran, are recorded herewith.* We have, with the approval of Dr. Miller, included some of his field notes on the specimens. All specimens are in the U. S. National Museum, to which the numbers cited herein refer, unless otherwise stated.

The localities recorded can be found on the American Geographical Society's Millionth Map of Hispanic America, as well as upon others.

Rana pipiens Schreber

A single juvenile specimen (No. 120965) was collected near the river on the flats below the town of Camotlan, 4,250 feet. According to Miller's notes this is called "tuk" in Mixe, the local Indian dialect.

Eleutherodactylus natator Taylor

A single specimen (No. 120962) was collected near a spring not far from Camotlan, 4,250 feet, April 14, 1944.

The specimen is a juvenile measuring 21.3 mm. snout to vent, and is somewhat shrunken; no rugosities are evident on the dorsal surface, although on the sides numerous low, short, longitudinal ridges are evident. The tympanum is very large, about four-fifths the diameter of the eye; the heel brought forward extends beyond tip of snout; the tips of the digits are markedly expanded; the webbing of the foot agrees exactly with Taylor's description (1939: 396); the inner metatarsal tubercle is large and elongate, continuous with a tarsal fold which extends a little more than half the length of the tarsus; first and second fingers are subequal in length. The lips are barred and there is a distinct interocular light band; in life the belly was yellow according to Miller's field notes.

*With the exception of the tadpoles.

The characters described as well as others agree in detail with those of typical *natator* from central Veracruz except for the interocular light band which is not mentioned in descriptions. This marking, however, is we are sure, a juvenile character, since adults show it very faintly (cf. Taylor 1939: pl. 40), and it has been observed, although not recorded, in juveniles from the region of the type locality. This as well as the length of the hind limb distinguishes *natator* from *rugulosus* (heel only to tip of snout), a species with which *natator* has been confounded. The specimen bears no similiarity to the other Mexican forms of the *rugulosus* group (*matudai, vocalis,* and *avocalis*) all of which possess different patterns and markedly greater or lesser webbing between the toes.

This specimen constitutes a considerable range extension for the species which previously has been known only from the immediate vicinity of the type locality at Cuautlapan in central Veracruz. The occurrence of *natator* in eastern Oaxaca is however to be expected, since there is a considerable faunal affinity of the localities represented.

***Anolis schiedii* (Wiegmann)**

A single male specimen (No. 120957) was collected on the outskirts of Quetzaltepec at 12 noon, April 17, 1944.

Head rather elongate; dorsal head scales rather small, slightly rugose, most with a single keel, none bi- or tricarinate; 6 scales bordering rostral posteriorly between the supralabials; scales between nostrils and in frontonasal area smaller than those in prefrontal areas; all keeled internasals, somewhat elongate, nine in a transverse series between nasals; frontonasals not elongate, equally as broad as long, few keeled; prefrontals like frontonasals, more with keels, median scales but little larger than frontonasals, lateral scales considerably larger; about 8 scales between posterior ends of canthal ridges; frontal ridges not sharp, rounded, anteriorly in contact in a slightly elevated area back of the level of the nasals; a moderate depression between frontal ridges; supraorbital semicircles composed of small scales posteriorly, larger anteriorly, all feebly keeled; supraorbital semicircles separated medially by three rows of moderately large, feebly keeled scales, reduced to 2 rows at one point; interparietal* over twice as long as broad, pierced medially by a parietal eye, its length (1.4 mm.) about equal to diameter of ear opening; latter round; three or four rows of small scales between interparietal and supraorbital semicircles; a rather sharply defined diamond-shaped area of typical head scales surrounding interparietal, bordered posterolaterally by small subgranular scales.

About 13 enlarged scales in the supraocular disc, forming approximately 3 rows, the inner composed of the largest scales, the outer of the smallest; small scales surrounding this disc on all sides, separating it from the superciliaries by about three to five rows and from the supraorbital semicircles by one or two rows; latter rows broken by one or two of the

*Generally referred to by students of anoles as the occipital.

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Taxon

supraoculars, which narrowly contact the scales of the supraorbital semicircles; one large scale in the anterolateral corner of the supraocular area, in contact with the superciliaries and separated from the enlarged supraoculars by one row of small scales, and from the anterior end of the supraorbital semicircles by two rows; four differentiated superciliaries; five differentiated canthals, rather sharply keeled; canthal ridge rather sharply defined, slightly protuberant; lores nearly vertical; a maximum of seven rows of loreals between canthal ridge and supralabials; latter eight to below middle of eye, separated from suboculars by a single row of small scales except posteriorly, where two directly contact the suboculars; temporals subgranular; infralabials 10-10 to below middle of eye; labial border of mental slightly less than that of rostral; mental slightly more than twice as wide as long, divided medially; six scales decreasing in size medially, bordering mental posteriorly between infralabials; gulars elongate, elevated, scarcely imbricate.

Dorsal scales keeled, imbricate, very small, those in the two median rows slightly enlarged and numbering 43 to the head length; lateral scales granular, gradually merging with the larger dorsals and ventrals; latter feebly keeled, slightly larger than dorsals and numbering 9 or 10 to one-quarter head length (4 mm.) Tail very slightly compressed, with a single middorsal row of scales; caudals subequal in size, considerably larger than dorsal scales; no enlarged postanals. Lamellae under 2nd and 3rd phalanges of fourth toe 15-16.

Color in alcohol uniform light golden brown, duller on sides; belly whitish; gular region whitish with dim, scattered, light gray flecks; dewlap purplish orange. In life, according to Miller, the throat is deep purple, the tail reddish, and the body greenish brown.

Snout to anterior margin of ear, 15.8 mm.; snout to posterior margin of interparietal, 13.7 mm.; diameter of ear opening, 1.3 mm.; snout to vent, 53.5 mm.; tail, 102 mm.; hind leg 47.5 mm.; tibia 13.6 mm.; foreleg 25 mm.

This species belongs to a group which in Mexico contains four species. The group is characterized by having relatively small (not granular or subgranular) dorsals, ventrals feebly keeled or smooth and a little or much larger than dorsals, the supraoculars numerous but enlarged (about 8-15), and the tail round. The Mexican species included are *aureolus, cymbops, laeviventris* and *schiedii*. All except the first are very rare; *cymbops* is known only from the type, a female in the British Museum; *laeviventris* has been recorded in Mexico only on the basis of Wiegmann's type (now in Berlin?), and one specimen in the Chicago Natural History Museum (Smith, 1939: 20-21) from Xico, Veracruz; and *schiedii* is known only from Wiegmann's type. *Anolis aureolus* is well known from numerous localities and many specimens, occurring in the Yucatan peninsula and in the area at its base.

A. schiedii is distinguishable from *A. aureolus* by shape of head (in

aureolus it is more elongate), color of dewlap (*aureolus* yellow, *schiedii* purple), and the smaller ventrals (much larger than dorsals in *aureolus*).

From *laeviventris* the present species differs in having a smaller occipital (larger than ear opening in *laeviventris*), the supraorbital semicircles separated by two or three rows of scales (in contact in *laeviventris*), no enlarged postanals in males (present in *laeviventris*), and in other respects less obvious.

The closest relationship appears to be with *cymbops*, a name based upon a Veracruz specimen that may prove to be the same as *schiedii*. The differences evident upon comparison with Boulenger's description (1885: 73-74) are few but fairly important. In *cymbops* the supraorbital semicircles are separated by only one row of scales (two or three in *schiedii*), there are three canthal scales (five in our specimen), the ear opening is "large, vertically oval" (round, moderate in size in ours), and the tibia is considerably shorter than the head (as long or longer in ours, according to method of measurement of head length).

Our determination of the specimen as *schiedii* is based upon Bocourt's illustration of the head scales of the type (1873: pl. 14, fig. 19) and upon Stuart's (1942: 5-8) brief notes in which he compares a related new species (*baguei*) with *schiedii*, a photograph of the type of which he had at hand. The similarity of our specimen to Bocourt's figure is remarkable and everything in Stuart's notes fits it also except for the number of ventrals, which we cannot be sure we count in the same manner (number in snout-tympanum length) as he. Our counts for the standard length cited vary from 28 to 49, according to different directions in which the counts are made.

***Leiolopisma gemmingeri* (Cope)**

A single specimen (No. 120958) was collected "in the trail below Ixcuintepec early in the morning on an apparently dry stretch of road," 1,200 feet, on April 19, 1944.

It is apparently typical with 26 scale rows around the body; two pairs of nuchals; frontoparietal double; and the lateral dark stripe narrow, restricted to the fifth and edges of the adjacent scale rows; the stripe remains about the same width throughout its length and its lower border is nearly as sharply defined as the upper border. Foreleg 9 mm., hind leg 14 mm., axilla to groin 24 mm., snout to vent 42 mm., tail complete, 80 mm.

***Drymobius margaritiferus margaritiferus* (Schlegel)**

A single male specimen (No. 120953) was collected while it was "crawling along the tops of low bushes (6 to 8 feet in height) along the river bank in the eastern edge of Camotlan, 4,250 feet, on April 13, 1944."

The scale counts and measurements (in mm.) are as follows: scale rows 17-17-15, ventrals 157, caudals 127, supralabials 9-9, infralabials 10-10, preoculars 1-1, postoculars 2-2, temporals 2-2, total length 960, and tail length 334.

According to field notes, the snake is "called in Mixe, '?aija?an' (leaf snake), doubtless because of its green color. The impression one gets on seeing it in the bushes is that it is a vivid green. The iris is round and deep brown in color with black pupil." The anterior edges of the scales are blue, the posterior edges black, and the center orange.

Although this race is to be expected on the Atlantic slopes of Oaxaca, this specimen apparently constitutes the first actual record for the state.

***Leptodeira annulata polysticta* Gunther**

Two specimens are in the collection; one (No. 120952), a male, was caught in the thatch roof of a house in Camotlan, 4,500 feet, on March 31, 1944; and the other (No. 120954), represented by a head and neck only, was "caught at 8:15 p. m. as it entered the house through a crack in the wall" in Camotlan, 4,250 feet, on April 14, 1944.

The scale counts are as follows respectively: scale rows 21-23-17, ?; ventrals 204, ?; caudals 96, ?; supralabials 8-8, infralabials 10-10, preoculars 3-3, postoculars 2-2, and temporals 1-2 in both. Body and tail spots 56 + 27, ?; total length 720 mm., ?; and tail length 80 mm., ?.

This snake is named in Mixe, "waigyalstsa?an"; "tsa?an" means snake, and "yai" means hair. "I was unable to get a translation of the entire word. . . . It seems to have some relation to the spots on the back—perhaps that they look like braided hair or something similar."

The specimen represented by the head and neck measured 29 inches when caught. The house into which it entered and was caught was brilliantly lighted by a gasoline lamp.

***Rhadinaea decorata* (Gunther)**

A single female specimen (No. 120955) was collected "by a Mixe young man near the town of Camotlan at 12 noon on April 17, 1944."

The scale counts and measurements (in mm.) are as follows: scale rows 17-17-17, ventrals 128, caudals 15 +, supralabials 9-9, infralabials 10-11, preoculars 1-1, postoculars 2-2, temporals 1-2-3, total length 229 +, and tail length 25 +.

The specimen is "predominantly brown in color, two black-edged yellow stripes [on each side, one following the other] on the head and neck just back of the eye. Then start two stripes which run the length of the body, beginning yellow and edged with black, which gradually change to brown as the upper black edge fades out entirely. Deep brown on head and below stripe, the latter lightening a bit to meet the white of the belly. From head back the brown of the upper back lightens to almost a light brown, becoming gradually lighter nearer the stripe."

***Toluca amphisticha* sp. nov.**

Holotype. U. S. Nat. Mus. No. 120950, male, from a locality called in Mixe Xuimygopk, 8,650 feet, about two-thirds of the distance from Ayutla to Cacalotepec. Collected by Walter S. Miller, March 15, 1944.

Allotype. U. S. Nat. Mus. No. 120951, female, from a locality called

in Mixe kachky walsky, 8,550 feet, near Cacalotepec. Collected by Walter S. Miller, March 15, 1944.

Paratype. E. H. Taylor, H. M. Smith No. 23637, male, from Cacaloapam, Puebla, about 20 kilometers north of Tehuacan, collected by E. H. Taylor.

Diagnosis. A member of the genus *Toluca,* with the rear maxillary teeth grooved and somewhat enlarged; it differs from all other members by having two paravertebral rows of spots rather than a single middorsal series; from certain forms it differs also in having 6 infralabials instead of 7, and perhaps in having fewer caudals. The dorsal pattern is completely unique within the genus *Toluca.*

Description of holotype. An adult male; rostral very slightly concave above, obtusely pointed in dorsal profile, rather sharply pointed in lateral profile; internasals distinct, half as long as prefrontals; median sutures of prefrontals and internasals together about as long as rostral in median line; frontal hexagonal, the two anterior edges forming an obtuse angle, the sides oblique, the posterior edges forming an acute angle; frontal nearly twice as long (4 mm.) as distance from tip of snout (2.3 mm.),a third longer than its distance from posterior end of parietal (3 mm.); supraocular large, its maximum width (1.5 mm.) about two-thirds maximum width of frontal (2.5 mm.); nasal elongate, entire, separated from preocular on one side by a small elongate loreal and on the other side by contact of the second supralabial and prefrontal; preoculars 1-1, on one side fused with the supraocular; postoculars 1-1, but an upper postocular apparently fused on each side to the supraocular; temporals 1-2; supralabials 6-7, second and third entering eye on one side, third and fourth on the other, fifth and sixth fused on one side (the side with 6); diameter of eye (1.9 mm.) nearly twice its distance from tip of snout (3.2 mm.), greater than its distance from lip (1.2 mm.); infralabials 6-6, the first in contact with each other, 4 in contact with chin shields, the fourth largest and in contact with both chin shields; anterior chin shields large, posterior ones smaller, but little larger than gular scales, narrowly in contact anteriorly.

Dorsal scales smooth, each with a single apical pit, in 17-17-17 rows; ventrals 120; 3 pairs of scales between posterior chin shields and first ventral; anal divided; caudals 33, all divided. Total length 262 mm., tail length 45 mm.

Dorsal ground color pale reddish brown, becoming brighter on the tail, which is reddish below as well as above, while the belly is cream colored anteriorly, somewhat whiter posteriorly. The pattern consists dorsally of a prominent series of small dark reddish brown spots anteriorly arranged in two longitudinal series, one on either side of the middorsal line; although the individual spots are distinguishable only anteriorly they merge insensibly over most of the length of the body where they form a continuous streak on either side. The middorsal area between the adjacent series of spots occupies one scale row and the edges of the

adjacent rows, becomes fainter posteriorly and is indistinguishable on the posterior sixth of the body. Lateral to the paravertebral dark bands is an indistinct light line about one scale row wide; and lateral to this is a faint dark line occupying adjacent portions of scale rows three and four. Below this lateral stripe the dorsal scales are uniform light reddish brown, stippled with black; this color fades gradually into that of the belly. Chin and gular region unmarked; irregular, scattered, moderately large dark spots on the belly, increasing in number and size posteriorly, concentrated at the anterior and posterior ends of the ventrals, and tending to form two very irregular longitudinal series. A few scattered, irregular flecks along the median subcaudal surface.

Variation. The only other specimens available are the allotype and paratype, the former of which is very similar in most respects to the holotype. In it, however, the loreals are 1-1, preoculars 1-1, not fused, postoculars 2-2, supralabials 7-7, ventrals 132, two unpaired and four pairs of scales between the first ventral and the chin shields; extreme tip of tail missing, perhaps merely the terminal cone; 26 subcaudals; total length 232 +, tail length 29.5 +.

In coloration the specimen is distinctly different from the holotype, the ground color being a slate gray; the spots in the paravertebral series remain discernible throughout the length of the body, although posteriorly they tend to be considerably broader than long and, together with similar, feeble marks on the lateral surfaces tend to form a pattern of irregularly broken crossbands. The belly is somewhat more heavily pigmented than that of the holotype; tail rather uniformly and heavily stippled. Twelve maxillary teeth, the anterior nine subequal in size and becoming gradually more clearly grooved on the external surface posteriorly; posterior three distinctly enlarged, perhaps one-third longer than the preceding teeth, and each provided with a very distinct lateral groove.

The paratype is very similar to the holotype in both scutellation and coloration; like the type it has 6-6 infralabials and 33 subcaudals; loreals 1-1, preoculars 1-1, postoculars 2-2, ventrals 127, five rows of scales between chin shields and first ventral; total length 272 mm., tail length 51 mm. There are thirteen maxillary teeth, the rear ones distinctly grooved but little enlarged, at least the posterior eight visibly grooved; nine palatine, fifteen pterygoid, and seventeen dentary teeth. Hemipenis typical with a very small apical area of papillate callyces, which grade into small spines that enlarge toward the base of the hemipenis.

The ground color is red as in the type and the dorsal pattern consists of paired spots which remain distinct throughout the body length although they become smaller and tend to form a pattern of transverse bands posteriorly; there are no middorsal spots.

A possible sexual dimorphism in ground color of the two sexes is apparent. Both males are reddish, the female slate. However, the same dimorphism, apparently uncorrelated with sex, has been observed in sev-

eral other forms of *Toluca* (*1. lineata, 1. varians, 1. wetmorei, megalodon, conica*).

Literature records. One specimen (the paratype) of this remarkably distinct form was available to Taylor and Smith (1942: 325-363) who referred it to *Toluca lineata varians* "with some doubt;" "perhaps separable from *varians*" (op. cit.: 356, 362). In that paper a photograph of the specimen appears as Fig. 1 of Plate 32*, and the maxilla of the same specimen is illustrated in Fig. 2 of Plate 35. Unfortunately, this latter figure does not show the fact that at least the posterior eight teeth are grooved although notes taken when the specimen was examined clearly state that they are grooved. This feature may be of more than casual significance, since likewise the allotype has several teeth other than the three posterior ones grooved. This condition has not been observed elsewhere in the genus†. The peculiar pattern of the paratype was observed by Taylor and Smith but in the absence of other similar specimens at that time, the allocation with *T. 1 varians* seemed more reasonable than any other possible course of action.

Comparisons. The most outstanding distinguishing characteristic of this species is the paired condition of the dorsal spots, a character which, so far as recorded at present, is unique in this genus; all other forms have a single middorsal stripe or series of spots. Characters of secondary importance include the reduced number of infralabials (6), the distinct internasals and prefrontals and possibly the reduced number of caudals. Another character of apparently considerable significance is the presence of grooves on a number of the middle and posterior maxillary teeth; in other forms of the genus grooves have been observed on only the posterior two or three enlarged teeth.‡

The pattern varies in distinctness to some extent but in all three specimens available the paired condition of the spots is clearly evident at least on the anterior fourth or fifth of the body. Variation in other forms of the genus is rather extensive but is limited to the development or reduction of middorsal, rather than paravertebral, spots or stripes. Curiously enough the pattern of *amphisticha* finds a parallel in *biserialis* of the related genus *Conopsis,* whose other member has a spotted pattern somewhat similar to that of the other forms of *Toluca.* We do not regard this parallelism as indicative of close relationship between the two species involved. The actual relationships of *amphisticha* probably are with one of the several other forms of *Toluca* occupying adjacent geographic ranges, *viz. T. conica, T. megalodon, T. lineata acuta,* or *T. 1 varians.*

From *conica* and *megalodon* the present species differs not only in pattern (these species having large middorsal blotches) but in the presence

The figure is labeled "?Conopsis lineata varians,*" a lapsus for"? *Toluca lineata varians.*"

†Except in an unidentified specimen from Cerro San Felipe, Oaxaca; see following discussion.

‡See preceding footnote.

of distinct internasals and prefrontals, usually (?) a loreal, and in dentition (in *conica* and *megalodon* the three posterior teeth are more enlarged and the other maxillary teeth are smooth). *T. 1. varians* has a different pattern (of small dorsal spots, sometimes arranged in transverse rows, but always with a middorsal series), the caudals are more numerous (36 to 45 in males, 29 to 36 in females), and the infralabials regularly 6-7 or more.* The only form recorded from localities within the known range of *amphisticha* is *T. 1. acuta,* common in the Tehuacan area where Taylor secured the paratype. With its very striking pattern of large middorsal blotches, *T. 1. acuta* is very different from *amphisticha;* also it has more infralabials (7 instead of 6) and the dentition is different.

Relationships. It may be observed that the range of *amphisticha* is intermediate between that of *conica and of 1. varians.* This arrangement suggests the possibility of intergradation with both forms, and in fact *amphisticha* does combine certain features of them. The description of eastern Oaxacan *conica* (the type) indicates that these may approach *amphisticha* in pattern (having "a median series of *transverse* spots or marks" [Taylor and Smith, 1942: 341; italics ours]), although presumably the extreme populations (those of Guerrero) are clearly different in pattern, having large median blotches (see figure of a Guerrero specimen on Pl. 34, *op cit.*). The difference between *conica* and *amphisticha* in fusion of prefrontals and internasals is not one that precludes a subspecific relationship, since a few *conica* exhibit or approach the normal condition. Likewise the differences between *1. varians* and *amphisticha* do not in themselves preclude intergradation, for the former does vary somewhat in pattern in the periphery of its range and shows a tendency toward development of transverse bands or series of blotches instead of large median blotches.

While we admit and even stress the possibility that *amphisticha, conica* and *1. varians* may intergrade, we do not believe it wise to conclude, as yet, that they do. It is not demonstrated that in adjacent areas the three forms actually do approach each other in character; it is only suggested that there may be an approach. Furthermore, the occurrence together in apparently exactly the same habitat of *amphisticha* with a form (*1. acuta*) which clearly intergrades with *1 varians* complicates the consideration of these forms as subspecies. It is well to await the study in detail of the critical Tehuacan area before attempting to conclude what may be the finer details of relationship of *amphisticha* to *1. acuta* and *1. varians.*

The specimen from Cerro San Felipe, Oaxaca, mentioned in the discussion of *T. 1. acuta* by Taylor and Smith(op. cit.: 348, Fig. 8, Pl. 35, Fig. 6) is not, we feel certain, referable to *amphisticha,* in spite of the fact that the internasals do and geographical location could conform; the

*In 150 specimens of typical *1. varians* with accurate locality data, the infralabials are as follows: 6-7, ten; 7-7, one hundred; 7-8, thirty; 7-9, one; 8-8, eight; 9-?, one.

pattern is widely different (large blotches, like *1. acuta* and *megalodon*) and the "fangs" are considerably enlarged. The dentition may be similar to that of *amphisticha* in some respects however; in notes recorded by Smith a number of maxillary teeth, other than the 3 rear ones, are grooved. At the present time it would seem more reasonable to associate the specimen with *T. megalodon,* which occurs in the same area and agrees in pattern and dentition, and in scutellation except for the fused internasals and prefrontals (a character known to vary to some extent in *conica*).

Phylogeny. This species provides a clue to the phylogeny of the snakes of the genera *Conopsis* and *Toluca,* because of the apparently intermediate condition of the pattern between the two extremes of large, middorsal blotches and longitudinal lines or series of small blotches. Since the southern peripheral forms of *Toluca,* the earliest migrants from a northern center of dispersal, tend to have large blotches and fused prefrontals and internasals, it is possible that both characters are primitive; at least there is a more or less uniform north-south trend in both characters. The blotches on the posterior part of the body are the least typical of the pattern in these forms of *Toluca,* appearing smaller and being flanked on either side by well-developed lateral spots, thus producing a cross-barred effect. It may be speculated that this change gradually worked forward until all the body possessed reduced median blotches and well-developed lateral spots. This is more or less the condition found in *T. 1. varians.* Three lines of evolution seem to have followed: the continued reduction of all spots, as in *T. 1. lineata* and *T. 1. wetmorei;* a secondary increase in size of spots, as in *T. 1. acuta* which nearly parallels the primitive forms (*conica* and *megalodon*) in pattern (there are differences, such as the small size of the lateral spots in the latter forms); and loss of the median spots (as in *amphisticha*).

Simplified for the sake of clarity of discussion, it may be considered that there are three major steps in the phylogeny of *Toluca*: the first migration wave, isolated south of the main plateau, was represented by *conica* and *megalodon*; a second wave, represented by *varians* on the extreme southeastern edge of the *main plateau;* and a third wave, represented by *1. lineata and 1. wetmorei,* just north of *1. varians.* It may well be that only two main waves of migration occurred, the first and second; these are fairly clear. The suggested third, however, may easily be merely a northward radiation of stock now represented by *1. varians.* Apparently *1. acuta* and *amphisticha* actually are derived from that (*1. varians*) secondary center of dispersal. The accompanying diagram illustrates this possible phylogeny of the forms of *Toluca.*

It is interesting to note again the parallelisms of *Conopsis* and *Toluca. C. nasus,* with middorsal blotches and fused internasals and prefrontals, by comparison with *Toluca* would appear to be the primitive form of its genus; its arrival in the southern portion of the main plateau of Mexico may well have been timed with that of *Toluca* in the southern extension

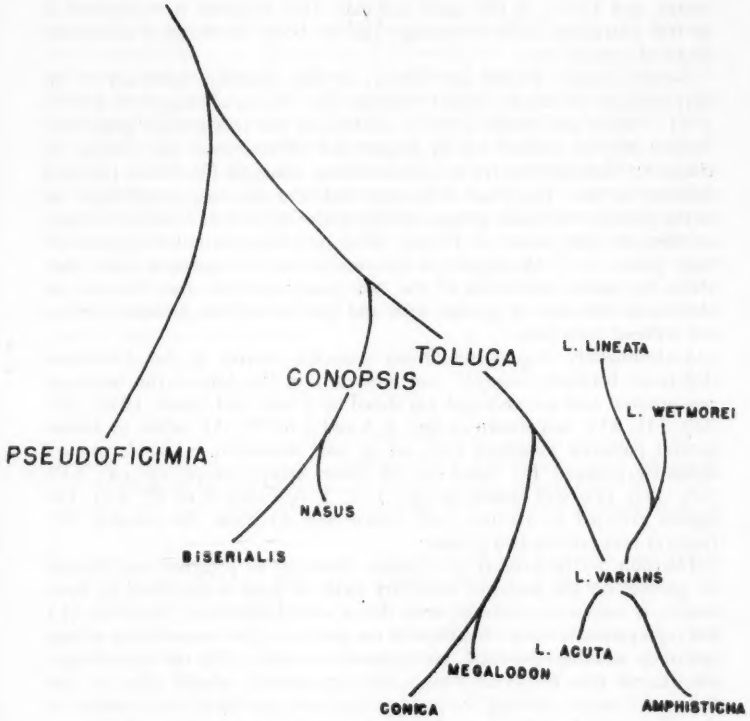

Fig. 1 Possible phylogeny of the forms of *Conopsis* and *Toluca*.

south of the Balsas river. If so, all further evolution of these two genera has been independent of each other. The two genera may well have been derived from some common northern stock, one evolving from western populations, the other from eastern. *Conopsis* did not undergo as extensive an evolution in pattern as *Toluca*, or at least no living forms now known so demonstrate.

That these two genera were derived from some stock that gave rise also to *Pseudoficimia* seems very probable. The latter possibly is the most primitive of the three; it has very large blotches. While the three genera probably are not actually related in a linear fashion, they do fall into a graded series from *Pseudoficimia* in the north and west, *Conopsis* in the

center, and *Toluca* in the south and east. This sequence is maintained in several characters, such as average size of body, dentition, evolutionary status of pattern, etc.

Generic Status. Bogert and Oliver, in their excellent summary of the herpetofauna of Sonora, regard *Conopsis* and *Toluca* as congeneric (1945: 378). Taylor and Smith (1942) considered the two groups generically distinct but, as pointed out by Bogert and Oliver, point out clearly "no characters that might serve to separate them, although Dr. Smith (*in litt.*) informs us that the chief differences between the two assemblages lie in the presence of feeble grooves on the posterior teeth of *Conopsis,* whereas these are not present in *Toluca.* Even this character is not apparent in their plate. . . ." In support of the conclusion of congeneric status they stress the great similarities of the two groups and the fact that the inclusion in this case of species with and species without grooved teeth is not without precedent.

Unfortunately Bogert and Oliver state the reverse of the dentitional difference between *Conopsis* and *Toluca**: in the former the teeth are *not* grooved and *not* enlarged (as stated by Taylor and Smith, 1942: 327, 329, 331, 334, and shown in figs. 4, 5 and 9 of Pl. 35), while in *Toluca* several posterior maxillary teeth *are* at least somewhat enlarged, and *are* distinctly grooved (as stated for all forms except *conica, op. cit.*: 339, 345, 347, 349, and shown in figs. 1, 2, 3, 6, 7 and 8 of Pl. 35.) The figures referred to are not well drawn, but do show the essential differences between the two genera.

Decision on the validity as a generic character of presence and absence of grooves on the posterior maxillary teeth, at least as exhibited by these snakes, is somewhat arbitrary, since this is a borderline case. However (1) the segregation is complete (there is no question upon examination of any specimen whether the teeth are grooved or not); (2) the assemblages are natural (the forms of *Toluca* are more clearly related *inter se,* and those of *Conopsis* among themselves, than any one form is to another of the other genus) and apparently have had a distinctly separate phylogeny; (3) the assemblages are polymorphic (two species, probably with several unrecognized races, in *Conopsis,* and four species, one with four races, in *Toluca,* as now understood); and (4) the point of difference between the groups is one which is ordinarily (not always, as pointed out by Bogert and Oliver) of considerable importance. The inconclusiveness of the decision rests solely upon the last (4th) point; the other points unquestionably support generic status for both groups.

***Trimorphodon biscutatus biscutatus* (Dumeril and Bibron)**

A single male specimen (No. 120956) is from Ixcuintepec, 2,738 feet. "It was killed early on the morning of April 21, 1944, by some men working in the field."

The scale counts and measurements (in mm.) are as follows: scale

*This was not incorrectly stated in Smith's letter.

rows 23-25-16, ventrals 241, caudals 81, supralabials 9-9, infralabials 12-13, preoculars 3-3, postoculars 3-3, temporals 3-3, 3-5, total length 857 mm., and tail length 160 mm. The dorsal spots are 21-12. The first 15 blotches are reddish, becoming brighter, tomato red toward head; the head bands, however, are not reddish; other bands normal, grayish.

The field notes include some interesting local beliefs as follows: "called *xo.x* by the Mixes. This one is said to be a small specimen. The snake is said to be very poisonous, to grow to 3 to 5 meters in length. Its bite is said to kill inside of 3 to 4 hours; bleeding at every pore and from the eyes and ears results. Several mules have died, to my own knowledge, bitten by a snake which is said to be of this kind. This specimen is 'tsaps *xo.x*' or 'red viper.' But they say there is a 'po:pxo:x' or 'white viper.' One of the old men told me that it is the same snake, but that according to the time of year the color changes."

The coloration is extraordinary. All other specimens we have seen, many in life, have been gray.

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The Salamander Name *Bolitoglossa mexicana* Dumeril, Bibron and Dumeril

By Hobart M. Smith

In 1936 Schmidt clearly diagnosed for the first time a certain species of large, plethodontid salamander with fully webbed digits, which occurs on the Atlantic slopes of northern Mexico and of Guatemala. Specimens of that species were known as early as 1854, when Dumeril, Bibron and Dumeril proposed the name *Bolitoglossa mexicana* for a miscellaneous lot of specimens among which were two of Schmidt's species. Schmidt used Dumeril, Bibron and Dumeril's name, in the form of *Oedipus mexicanus,* and in that choice has been followed by subsequent authors. Unfortunately it now appears that *mexicanus* is actually a synonym of *Bolitoglossa platydactyla,* a closely related species of Veracruz and Tabasco. Reasons for arriving at this conclusion and a new name for the southern species are presented in the following:

I.

The name *Bolitoglossa mexicana* was first proposed by Dumeril, Bibron and Dumeril (1845: 93). In the original description five lots of specimens were mentioned or described. Lot No. 1 consisted of four specimens without locality or name of collector; perhaps because of the larger size of the specimens this lot was described in advance of the others. In a later paragraph measurements were given for specimens in all the first four lots and again those for Lot No. 1 preceded the others.

Lot No. 2, a single specimen without locality data, collected by M. Bell, was next described.

Lot No. 3, consisting of five specimens from Oaxaca, collected by M. Guisbrecht, was described as a second "variety" or variation, "possibly a distinct species." One specimen is illustrated on plate 104, fig. 2. As Schmidt (loc. cit.) has pointed out, *Pseudoeurycea bellii* is the species illustrated.

Lot No. 4 of four small specimens collected by M. Sale was next described from Vera Cruz. The locality identifies these as *Bolitoglossa platydactyla.*

II.

The treatment of these four lots of specimens is followed by a discussion in which Dumeril, Bibron and Dumeril state that they comprise the types of the genus *Oedipus* of Tschudi, who found them in the Paris Museum labelled by Cuvier as *Salamandra platydactyla,* from Mexico. But, the authors continue, they do not know that that name was actually decreed by Cuvier, as Tschudi (1838) and others have maintained.

Clearly Dumeril, Bibron and Dumeril did not regard Cuvier's name as available, probably because it appeared as a *nomen nudum* and only in the synonymy of Gray's *Salamandra variegata* (1831: 107). The latter name, as long realized by herpetologists, is invalid because it is a hom-

onym of an earlier name, *Salamandra variegata* Bory de Saint Vincent (1829: 68). Since Dumeril, Bibron and Dumeril did not accept Cuvier's name of *Salamandra platydactyla,* they likewise refused to accept Tschudi's genus *Oedipus,* the type of which was cited as *Oedipus platydactylus* Cuvier. To them the latter specific name was non-existent, and no genus based upon a name that had never been really proposed could, they concluded, be recognized. Had Dumeril, Bibron and Dumeril accepted Cuvier's name, it is reasonable to suppose that they would also have accepted Tschudi's genus *Oedipus* and would have used the name *Oedipus platydactylus* for their specimens instead of proposing new generic and specific names. Under the circumstances, however, they regarded it necessary to propose in acceptable form their own names for the genus and for the species even though they were represented by exactly the same specimens (as well as others in addition) that Cuvier had tagged as *Salamandra platydactyla.* Unfortunately they cited (1854: 94) a reference to Tschudi's combination: "*Oedipus platydactylus* Tschudi, Class Batr . . .". Technically this citation alone may invalidate the name *mexicana,* which may on that account be regarded as a synonym of *platydactylus.* The citation is accompanied by a question mark however. Whether this may influence the disposition of the name is not certain, since the International Rules of Zoological Nomenclature, and the Opinions thereon, do not clearly prescribe a course of action for such cases.

Brocchi (1883), like Dumeril, Bibron and Dumeril, made no mention of Cuvier's name, presumably for the same reasons. It would appear that these authors are correct, so far as its "decree" by Cuvier is concerned, for the name was a *nomen nudum* until made available by Gray (1831: 107). Gray is then the real author of the specific name. The identity of Cuvier's specimens is relatively immaterial, since exactly the same specimens constitute the types of *Salamandra platydactylus* Gray and the types of *Salamandra variegata* Gray in whose synonymy the former name appeared. Tschudi's genus *Oedipus,* it may be added, is in reality available, although invalid because of homonymity with *Oedipus* Berthold (1827), an Orthopteran genus.

One other nomenclatorial anomaly may be mentioned here. On page 94 Dumeril, Bibron and Dumeril use the name *Salamandra togata,* a *nomen nudum* of Valenciennes, for the four lots of specimens mentioned. Presumably this name should remain a synonym of *mexicana;* its disposition would then depend almost completely upon that of the latter name.

III.

After the discussion by Dumeril, Bibron and Dumeril of these matters, another series of specimens, Lot No. 5, consisting of two individuals from Dolores, Peten, Guatemala, collected by M. Morelet, is described in some detail. The description is stated clearly to be an addendum to the preceding discussion, the specimens having been received too late. By locality as well as description we may be confident that these two are identical with the form to which Schmidt has restricted the name *mexicana.*

IV.

No type was selected by Dumeril, Bibron and Dumeril for their species. However, Brocchi (1883: 113-114, pl. 18bis, figs. 1-4) discusses and figures ***Spelerpes mexicanum.***

On page 114 he briefly describes the pattern of "the type," and later describes the pattern of the Peten specimens in a comparative manner. Clearly he does not consider the Peten specimens to be the types. Just which one of the other four lots was chosen as the type series (by Brocchi in effect although possibly by Dumeril, Bibron and Dumeril unofficially) is not indicated in the text, but the explanation of plate 18bis, figure 3, states "*Spelerpes mexicanum* (type). Vera Cruz." The figure fits the Peten species better than *platydactyla,* but could be either. The other three specimens illustrated, all under the same name but each regarded as a "variation," are pretty clearly *platydactyla.* All are from "Vera Cruz," so it is reasonable to suppose the locality for the type is correct and the pattern simply one of the many variations of *platydactyla,* the Veracruz species. These four figures account for Lot No. 4 of four small specimens mentioned by Dumeril, Bibron and Dumeril from Veracruz. One is selected as the type. We assume that no further specimens from this locality were added to the collection after the time of Dumeril, Bibron and Dumeril.

Dumeril, Bibron and Dumeril (1854: pl. 104) figured two specimens of their *Bolitoglossa mexicana.* We have already stated that one (Fig. 2) is of *Pseudoeurycea belli,* representing Lot No. 3 which they were not sure was the same as the rest. The other specimen illustrated appears to be *platydactyla* and not the Peten species, although it is not one of the four illustrated by Brocchi. Therefore it must have been from either Lot No. 1 or No. 2, representing a total of five specimens, and may be taken as one of the clearest indications of the identity of the two lots.

V.

Dumeril, Bibron and Dumeril may be said, then, to have had the following material of *B. mexicana*: (1) five cotypes (Lot Nos. 1, 2) from "Mexico," belonging to *platydactyla* as indicated by plate 104, figure 1, and further indicated by the fact that they are the specimens labelled by Cuvier as *Salamandra platydactylus* and accepted by Gray as identical with his *variegata;* (2) four cotypes (Lot No. 4) from Veracruz, belonging to *platydactyla* as shown by Brocchi's figures and as indicated by locality; (3) five cotypes (Lot No. 3) regarded as a possibly distinct species and actually belonging to *Pseudoeurycea bellii;* and (4) two referred specimens (Lot No. 5) from Peten, belonging to an otherwise unnamed species. The latter rather dubiously could be considered cotypes. Obviously the authors regarded the Mexican, including the Veracruz, specimens as representative of the typical form of the species, describing them first and illustrating them. They were intent upon legitimately naming the species that Cuvier had failed to name properly. Brocchi's selection of the

type seems well considered. Except under peculiar circumstances the allocation of the name *mexicana* with any of the other lots of cotypes would have been ill-advised, especially to any of those that Dumeril, Bibron and Dumeril realized could well represent species other than that which they chose as typical. The lack of any other name for the Peten species provides a peculiar circumstance to be sure, and Schmidt's desire to avoid undue multiplication of names is entirely proper, but allocation of the name with it is impossible in view of Brocchi's prior and clear selection as the type a specimen from Veracruz which is referable to *platydactyla*. *B. mexicana* thus allocated, the southern species remains unnamed. We suggest:

Bolitoglossa moreleti sp. nov.*

Bolitoglossa mexicana Dumeril, Bibron and Dumeril, 1854: 96 (*part*: the Peten specimens only; Taylor and Smith, 1945: 545-547, fig. 58) *part*: excluding the synonymic reference to Dumeril, Bilbron and Dumeril).

Oedipus mexicanus Schmidt, 1936: 146-147 (*part*: excluding the synonymic references); Stuart, 1943: 10, 11, 12, 13, 14, 27, 31, 32, pl. 2, fig. 2 (*part*: excluding synonymic references).

Holotype. U. S. Nat. Mus. No. 116079, taken from a bromeliad in the vicinity of Palenque, Chiapas, by Rozella and Hobart M. Smith.

Paratypes. Field Numbers (Walter Rathbone Bacon Collection) of H. M. Smith, Nos. 8529-8534, 8632, 8634-8653, 8698-8732, 8741-8744, 8764-8767, 8828-8830, of which 28 are catalogued as U. S. Nat. Mus. Nos. 116071-116098, all topotypes; and U. S. Nat. Mus. No. 116070 from Piedras Negras, Guatemala.

Diagnosis. A large member of the genus *Bolitoglossa* (as defined by Taylor, 1944: 219, 222); belly generally and sides always black or dark brown; at least some, generally numerous white flecks or short streaks on belly; upper border of dark lateral areas very sharply defined, irregularly serrate; dorsal light color orange to pale yellow; dorsal dark markings extensive, sharply defined, basically arranged in two, irregular, paravertebral lines, but with considerable variation.

Remarks. The type is figured by Taylor and Smith (1945: 546, fig. 58c). We propose the new name because none previously applied to it is available for this species now that the name previously applied to it, *Bolitoglossa mexicana*, has been shown to be a synonym of *B. platydactylus*.

*Named for the French collector, M. Morelet, who secured the first recorded specimens of the species, and who is famed in the annals of early herpetological exploration in Peten, Guatemala.

SUMMARY

1. Dumeril, Bibron and Dumeril included several species among the specimens described in 1854 as *Bolitoglossa mexicana.*

2. Dumeril, Bibron and Dumeril failed to designate the type for *Bolitoglossa mexicana.*

3. In 1883 Brocchi selected a type specimen for *Bolitoglossa mexicana* Dumeril, Bibron and Dumeril; it proves to be *B. platydactylus* from Veracruz.

4. Thus *B. mexicana* is a synonym of *B. platydactylus.*

5. In 1935 Schmidt restricted the name *mexicana* to a species represented by still another group of specimens included by Dumeril, Bibron and Dumeril in their description of *Bolitoglossa mexicana.*

6. Schmidt's species cannot be known as *mexicana* since Brocchi restricted the name at an earlier time to another species, *B. platydactylus.*

7. Schmidt's species therefore remains unnamed.

8. *Bolitoglossa moreleti* is the new name proposed for Schmidt's species.

9. The name *Salamandra platydactylus,* usually credited to Cuvier, is actually Gray's name.

10. The name *Salamandra togata,* usually credited to Valenciennes, is actually Dumeril, Bibron and Dumeril's name.

11. *S. togata* Dumeril, Bibron and Dumeril is a synonym of *B. platydactyla* Gray.

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A Lacepede Reprint

In Herpetologica, Vol. 2, p. 162, I mentioned a 16 mo. reprint of the regular quarto edition of Lacépède's Histoire Naturelle des Quadrupedes Ovipares et des Serpens, of which I had only the first two volumes, corresponding to the first volume of the quarto edition. These were dated 1788, which is also the date of the quarto volume. I have now secured the second two volumes, thus completing the set. However, these last two volumes are dated 1790, whereas the second quarto volume (covering serpents) is dated 1789. The same publisher issued both sets: Hotel de Thou, Rue des Poitevins. The Catalogue of the Library of the British Museum (Natural History), vol. 6, p. 158, mentions a 12 mo. set of Buffon, which does not include Lacépède's reptile section. Possibly the BM set is incomplete and these four little books were issued as a part of that set. The texts of the two editions seem to be similar, but the plates of the smaller issue are inferior.—L. M. Klauber.

An Additional Note on a Supposed Specimen of *Hyla Phaeocrypta*

By M. B. Mittleman

Some years ago, Burt reported taking *Hyla phaeocrypta* Cope in Riley County, Kansas (Science, 1928, 67:630). In my recent study of this species I suggested that the specimen was probably referable to *H. v. versicolor* (Copeia, 1945, 1:34), although at the time of writing I had not examined Burt's specimen. My opinion then was based on the purely empirical grounds of geographic provenance. While it did not appear impossible that *phaeocrypta* might have migrated from its Mississippi Alluvial Plain habitat to the dissected till plains of the Central Lowlands, via the Kansas River, the range of this species, as plotted on the basis of known specimens, seemed to preclude such a probability.

I have subsequently examined Burt's specimen, which is now number 65029, in the collection of the University of Michigan Museum of Zoology; it is catalogued as coming from Wildcat Creek, Manhattan, Riley County, Kansas. The specimen has darkened with preservation, but part of its pattern is discernible. The subocular light spot is evident on one side, and may have been present on the other, an interocular vitta is present, as is also a prominent cruciform marking on the anterior part of the back. The posterior parts of the femora are marked with a dark, vermiculate pattern, but it is impossible to tell what color the interstitial areas may have been; likewise, there is no hint of the original coloring of the axillary and inguinal regions. Thus, no definitive characters of color and/or pattern remain, those still existing being shared by both *phaeocrypta* and *versicolor*, although it is rare for the former to have the dorsal pattern on the anterior part of the back.

The skin is fairly smooth, but this is a difficult character to evaluate. The specimen is male, and does not appear to have attained sexual maturity; in itself, this point would carry considerable weight, for *phaeocrypta* males of 29 mm. and over are sexually mature, while *versicolor* males have not been found sexually mature under 40 mm. It is not always possible to determine this accurately however, so that biometric examination of the specimen is necessary. In the following table, the measurements and proportions of the Kansas specimen are tabulated, followed by those of 91 sexually mature male *phaeocrypta* and 50 sexually mature male *versicolor* (data from Mittleman, Copeia, 1945, 1:33); the figures for *phaeocrypta* and *versicolor* are arithmetic means, followed in parenthesis by the standard deviations; the two final columns show the value of *P* expressed as a percentage in the comparison of each of the Kansas specimen's proportions with the *phaeocrypta* and *vericolor* series.

	Kansas	*phaeocrypta*	*versicolor*	*P phaeocrypta*	*P versicolor*
snout-anus length	34.2	33.9 (2.2)	44.8 (2.4)		
head length	10.1	10.7 (.74)	13.5 (.76)		
head width	12.0	12.5 (.79)	16.3 (1.0)		
intertympanic width	10.4	10.5 (.62)	13.3 (.73)		
diameter eye	3.7	3.8 (.29)	4.1 (.26)		
diameter tympanum	2.0	1.6 (.16)	2.5 (.25)		
internasal space	3.0	2.9 (.28)	3.4 (.31)		
interocular space	3.3	3.5 (.37)	4.0 (.33)		
hind limb length	47.0	51.0 (3.7)	62.0 (3.5)		
4th toe length	15.0	15.1 (1.5)	19.8 (1.2)		
3rd finger length	9.0	10.4 (.89)	14.3 (.85)		
snout-anus/hind limb minus 4th toe	107.0	97.0 (6.5)	107.0 (5.4)	12.0	100.0
4th toe/snout-anus	43.8	44.0 (2.2)	44.0 (1.8)	93.0	92.0
4th toe/hind limb	31.9	31.0 (1.5)	32.0 (1.2)	55.0	94.0
snout-anus/hind limb	72.7	68.0 (2.8)	71.7 (3.0)	9.5	74.0
tympanum/eye	54.0	43.0 (2.9)	60.0 (5.8)	0.02	32.0
interocular/snout-anus	9.6	10.3 (.94)	8.9 (.70)	50.0	43.0
internasal/snout-anus	8.7	8.5 (.75)	7.9 (.58)	72.0	14.0
tympanum/snout-anus	5.8	4.7 (.41)	5.6 (.44)	0.7	57.0
eye/snout-anus	10.8	11.1 (.72)	9.3 (.68)	98.0	2.8
head length/snout-anus	29.5	31.8 (1.7)	30.1 (1.0)	19.0	64.0
head width/snout-anus	35.1	36.3 (1.8)	35.7 (1.6)	51.0	71.0
head length/head width	84.2	87.5 (4.0)	84.7 (3.6)	41.0	90.0
head length/inter-tympanic	97.1	102.9 (4.0)	101.5 (3.0)	15.0	14.0

From these data it is evident that Burt's specimen most nearly approximates *versicolor* in the majority of its proportions. In its gross measurements, it shows considerable similarity to the *phaeocrypta* means, and were these used alone, it might easily be mistakenly identified as a *phaeocrypta*. I have pointed out (op. cit.) that *phaeocrypta* and *versicolor* are remarkably similar, and differ only in a few proportions, the coloring of the inguinal, axillary, and postfemoral areas, and the voice.

I have shown (1945: 32) that proportionately, *phaeocrypta* possesses a longer hind limb, greater interocular and internasal spaces, a smaller tympanum, and a larger eye, although it is in all respects a smaller species than *versicolor*. The affinity of Burt's specimen with *versicolor*, rather than *phaeocrypta*, is indicated in the *P* tables, for in the ratios of body to hind limb, body to hind limb minus 4th toe, tympanum to eye, and tympanum to body length, the probabilities of agreement between the Kansas specimen and the *versicolor* series are much greater than between this specimen and the *phaeocrypta* series. In addition, Burt's specimen shows more probability of affinity with the *versicolor* series than the *phaeocrypta* series in the ratios of the 4th toe to the hind limb, the head length to the snout-anus, head width to the snout-anus, and the head length to the head width. Interestingly enough, however, in the ratios of the internasal space to the snout-anus, the interocular space to the snout-anus, and the diameter of the eye to the snout-anus, Burt's specimen is closer to the *phaeocrypta* series so far as statistical probabalities go. It should be noted however, that in these variables, considerable overlap exists, so that only a total comparison is of any probable significance.

I conclude, therefore, that these data corroborate my original suggestion, and that Burt's specimen is properly referable to *Hyla v. versicolor*.

Nocturnal Observations on Sea-Snakes in Bahia Honda, Panama

By George S. Myers

During the Allan Hancock Pacific Expedition of 1938, the Velero III anchored in Bahia Honda, Panama, on March 1. The bay is large, deep, and land-locked, and at the time we were there the water was clear although floating detritus (leaves, sticks, etc.) from the surrounding forests was seen. That evening, I carried on night fishing with a dipnet from the lowered gangway of the vessel at anchor. I do not have the depth at this point, and the bottom could not be seen, although objects at a depth of at least three and perhaps four fathoms were clearly visible in the area lighted by the electric fishing light. I do not believe the depth could have been less than five fathoms, nor much more than ten.

Soon after fishing commenced, at about 7:30 P. M., the first sea-snake was seen, and more continued to appear until fishing was discontinued at midnight. During this time, about fifty snakes, all of course being *Pelamydrus platurus* (Linnaeus), were seen in an area about 30 feet in diameter. Of these, 25 or 26 examples were captured. The three or four adults were taken alive to the San Diego Zoological Park, and I have no further information concerning them. The 22 others, all young individuals, are now preserved in the Stanford Natural History Museum (Nos. 7708-7729).

These 22 snakes range from 220 to 311 mm. in length, the average being 264 mm. The smallest show a very faint trace of the umbilical scar. No snakes intermediate in size between these young and the large adults were seen. Smith (1926, Monogr. Sea-snakes:118) mentions several color varieties of this species. Although every one of the 22 Bahia Honda young differs from each of the others in color markings, all might be placed in Smith's varieties 1 and 4.

All the snakes seen that night made their appearance in exactly the same manner. A movement could be seen at the ultimate depth of vision, which slowly resolved itself into a snake, leisurely undulating straight upward towards the surface, which was mirror-still. Upon reaching the surface the head of the snake popped into the air, and the animal floated upward to an inclined or nearly horizontal position while air was taken. I did not take the time the snakes remained at the surface, but it could not have been over ten seconds. Then they leisurely turned and undulated straight downward towards the bottom and disappeared from view. It was impossible, of course, to tell how long a period any individual remained under water between visits to the surface. I do not believe many of the individuals seen were "repeats," since approximately two-thirds of them were frightened by efforts made to catch them with the net, and about half of those seen were caught. The frightened snakes usually made off obliquely downward, away from the disturbance, and probably did not rise again within the lighted area, where they could be seen.

No phototropic response on the part of the snakes was apparent. Even those individuals that rose at the very limits of the lighted, visible area, came straight up and departed straight down, as if no light had been present, and even manipulation of the light failed to affect their movements. On the contrary, it revealed that snakes beyond the lighted area were coming up and going down just like those in the light. The snakes did not appear to be foraging. Fish were very few that evening, but I did not see any snake evince any particular interest in what few were present, nor in the vegetable debris floating slowly, at various depths, in the slow tidal current. Next day in the vicinity of the Secas Islands, persons fishing in the vessel's small boats observed several adult sea-snakes swimming at the surface a half mile or more offshore, in daylight. These observations lead one to suspect that feeding is done in the daytime, and that the snakes spend the night at the bottom, rising to the surface only to breathe. However, this species has been found at sea over deep water, and it cannot be presumed that snakes in such places ever get to the bottom.

The large proportion of young, and the smaller number of adults, that came to the surface in a very small area during a period of four and one-half hours are of interest as an indication of the abundance of these snakes. The great preponderance of young individuals may be explainable in two ways. The bay may be a place frequented by females for parturition, and the young of the year born there may not yet have scattered. On the other hand, it is possible that the population observed was a resident one, and that the large number of young was due simply to their youth. Herre (Copeia, 1942:8) has shown that eels feed upon sea-snakes, as well as sea-snakes upon eels, and large eels are common wherever sea-snakes occur. It is probable that, as in other creatures, each year-class of sea-snakes is considerably thinned in numbers by the time the reptiles reach maturity.

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The Identity of *Siredon Harlanii* Dumeril, Bibron and Dumeril and *Axolotes maculata* Owen

By Sherman C. Bishop

The correct allocation of *Siredon Harlanii* and *Axolotes maculata* is important in connection with the nomenclature of the forms of Ambystoma, particularly in view of the recent increase in interest in that group in the border states and Mexico.

Siredon Harlanii Dumeril, Bibron and Dumeril (Erp. Gen. 9:181-182, pl. 95, figs. 1-1a, 1854)[1] seems to have received little attention since it was included in the synonymy of *Ambystoma tigrinum* in Boulenger's "Cat. Batrachia Gradientia, etc., of the British Museum," p. 44, 1882. Dunn, in his paper, "The Races of *Ambystoma tigrinum*," (Copeia, No. 3, pp. 154-162) properly allocated many of the species and subspecies but did not take *harlanii* into consideration. *Axolotes maculata* Owen (Ann. & Mag. Nat. Hist., 1st Ser. 14:23, 1844) was placed by Dunn in the synonymy of *Ambystoma tigrinum velasci* Duges.

In Dumeril, Bibron and Dumeril's account, Owen's species was placed in the snyonymy of *harlanii* with *Siredon maculatus* Baird and Schneider's unnamed salamander from Lake Champlain. In the body of this paper, *harlanii* was compared with Schneider's Lake Champlain salamander, which was doubtless a Necturus, and with Baird's *Siredon lichenoides*. The description of *harlanii* was based on two specimens, received from Dr. (R.) Harlan, which were said to have come from the same locality that provided Baird's *lichenoides*, near Spring Lake in the Valley of the Rio Grande. The description and figure, in color, given by Dumeril, Bibron and Dumeril agree very well with that of *lichenoides* as given by Baird in his paper with Girard in "Exploration and Survey of the Valley of the Great Salt Lake of Utah" by Howard Stansbury (Senate Doc. Special Session, March 1851, pp. 336-338, 1852). It is quite generally agreed that *lichenoides* Baird is a synonym of *Ambystoma tigrinum mavortium* and the weight of evidence indicates that *Siredon Harlanii* should be placed in the same category, the reference to Schneider's Lake Champlain salamander having little significance.

Axolotes maculata, on the other hand, undoubtedly represents a distinct species, although the specific name is preoccupied by Shaw's *Lacerta maculata* (equals *Ambystoma maculatum*). *Axolotes maculata* Owen is apparently the species recently described by Taylor (Copeia, No. 3, p. 143, 1941) as *Ambystoma rosaceum*, a relationship first indicated to me by Joseph A. Tihen. Both names were based on specimens from the same general area, Chihuahua, Mexico and the description and figure given by Owen are diagnostic.

Definite allocation of the name *harlanii* with *Ambystoma tigrinum mavortium* will avoid the otherwise possible eventuality that the name be restricted to the species of one of its synonyms, *A. maculata* Owen, and thus antedate Taylor's name, *A. rosaceum*.

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1. Volumes 7 and 9 and the Atlas are by A.M.C. Dumeril, G. Bibron and A. Dumeril and should be so cited.

A Herpetological Collection from the Vicinity of Key West, Florida

By E. Ross Allen and Ralph Slatten

The Florida Keys are a chain of marl and coral islets and reefs which extend southwest from the end of the peninsula. Key West, the southernmost city of the United States, is built on the last of these flat, semi-tropical islets which is but a mile and a half wide by four miles long. The average yearly temperature is seventy-seven degrees. It lies 152 miles southwest of Miami by road, bridge, and ferry, and 120 miles by air. Most of the keys are covered by brush and some pine, and are surrounded by mangroves. Many exotics such as palms, banyans, papayas, cacti, and tropical fruits have been introduced into the gardens of Key West which afford a haven to accidentally introduced reptiles and frogs.

The following list comprises specimens brought back alive or observed on Key West Proper unless otherwise noted. The collecting was done from August 24 to 26, 1937.

Bufo terrestris (Bonnaterre). One specimen.

Hyla cinerea cinerea (Schneider). Two green tree frogs were collected.

Hyla septentrionalis Boulenger. The largest of fourteen specimens collected was a female measuring 92 mm. in length of body, and 210 mm. stretched out. Eggs, tadpoles, and recently transformed frogs were also collected.

Eleutherodactylus ricordii (Dumeril and Bibron). Two specimens.

Gastrophryne carolinensis (Holbrook). One specimen.

Alligator mississipiensis (Daudin). Three alligators, four, four and a half, and five feet respectively, were caught at night with the aid of a headlight. They were captured in salt water, and were unusually fat, healthy specimens of a bright color.

Sphaerodactylus notatus Baird. Forty-six reef geckos were found under rocks and rubbish; one egg was found hatching. Identified by Dr. Stejneger and Karl P. Schmidt.

Sphaerodactylus cinerus Wagler. Forty-eight were found in the sand under grass and stones. Identified by Dr. Stejneger and Karl P. Schmidt.

Anolis carolinensis Voigt. Seventeen specimens were collected. Six chameleon eggs were found in the sand under some stones, almost ready to hatch.

Anolis porcatus Gray. Two specimens collected. Probably introduced from Cuba by fruit boats. Identified by Karl P. Schmidt.

Anolis stejnegeri Barbour. Eleven specimens were collected. Identified by Dr. Stejneger and Karl P. Schmidt.

Cnemidophorus sexlineatus (Linnaeus). Two specimens were collected.

Eumeces egregius egregius (Baird). Two specimens.

Eumeces fasciatus (Linnaeus). Two specimens.

Opheodrys aestivus (Linnaeus). Twenty-one green tree snakes were collected at night on bushes. They averaged much larger than the north Florida forms, were a dull green above and pale green below, and seemed

more vicious than the mainland specimens. The largest individual measured 1160 mm., 425 of which was tail.

Coluber constrictor constrictor Linnaeus. Three black snakes, typical of those found in north central Florida, black with blue-black bellies and white throats, were collected. The black snakes found near Miami are usually a dark olive-brown, with a white belly.

Elaphe rosacea (Cope). Two specimens, collected on Cudjoe Key, just off Key West, identified by Dr. Thomas Barbour.

Natrix compressicauda (Kennicott). Nine specimens of this common species were collected in salt water. The color of the belly pattern varied from light to dark brown. One red specimen had black specks along the sides, which seems to be an unusual variation since specimens from the West Coast do not have these specks. Identified by Dr. H. K. Gloyd.

Crotalus adamanteus Beauvois. Two medium-sized specimens were caught on Cudjoy Key, off Key West. The natives of Key West claim that rattlesnakes are quite numerous, and that they feed on rats and birds, rabbits being quite scarce.

Chelonia mydas (Linnaeus). A specimen recently caught off Key West was seen.

Eretmochelys imbricata (Linnaeus). A specimen caught near Key West was seen.

Caretta caretta (Linnaeus). A baby loggerhead was collected on Key West.

The Reptile Institute, Silver Springs, Florida.

Effect of the 1944 Hurricane On Grand Cayman Reptiles

By C. Bernard Lewis

The hurricane which crossed the Caribbean in October, 1944, lingered in the vicinity of Grand Cayman for nearly 5 days and was considered by many old inhabitants the worst storm to strike the island since 1872. The sea caused far more damage than the wind, which at its maximum reached a velocity of about 150 miles per hour. Generally speaking, the island is protected by reefs but it is exposed on the south-west, from which direction the storm swept the island. Being extremely low-lying, water was carried far inland and salt spray penetrated the entire island.

Arriving in mid-November, I had an occasion to visit and spend several months on Grand Cayman just after the storm. Approaching Georgetown anchorage from the west, not a green leaf could be seen on any plants more than a foot above the ground. It appeared as though fire had run through the land. Two months later many trees had put forth new leaves but those which were closest to the shore were dead—at least above ground. Five and six months later many of these plants were springing from their roots, to make a fresh start in life. All crops were destroyed and many of the larger trees severely damaged and uprooted. The abundant fruit trees suffered in particular and those that were not completely destroyed may take several years to recover sufficiently to bear again.

Grand Cayman is famous for the abundance of its birds and the tree lizard (*Anolis conspersus*) with the blue throat fan[1]. For 3 weeks after my arrival not a single example of the lizard was to be seen in the vicinity of Georgetown and except for a few canaries, no birds made their appearance in the same area. The storm had obviously very seriously affected all arboreal life. After several months a few young Anolis were occasionally seen; presumably these lizards were in the egg stage during the storm. Six months later birds were still uncommon.

It is interesting to note that the day following the subsidence of the hurricane, a small snake was found under a stone while clearing debris in Georgetown. This snake, as described to me by a schoolteacher, was undoubtedly *Typhlops caymanensis,* only one specimen of which—the type —has ever been collected[2]. The snake is decidedly a rare species and apparently had been driven to the surface by the flooding of its burrow.

Alsophis angulifer caymanus became particularly abundant around habitations and towns during the months following the storm. Apparently the snakes were driven from the bush through lack of food to seek mice and rats about buildings; of course, the Hyla, a favorite food of Alsophis, is always abundant in the vicinity of towns as they commonly breed in cisterns and wells.

Perhaps significant also was the scarcity of *Leiocephalus varius.* During the summer months of 1938 I found it extremely abundant along the north coast in the vicinity of Northside and Old Man Bay. On a single visit to

these localities in November, 1944, I failed to observe a single example. In March, 1945, a few young individuals were observed along stone walls at Southwest Point. A single adult was noted under the bath house at West Bay beach but the species is always scarce along the west coast of the island. This lizard, being a littoral species was undoubtedly seriously affected by the storm in those areas which were exposed to the heavy seas such as Southwest Point, but it is not clear why the lizards were not observed at Northside.

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On "Spitting" Cobras

BY WESLEY H. DICKINSON

I have noted that the "spitting" *Hemachatus* gives a short sharp hiss, whereas the "non-spitting" *Naja* gives a longer hiss that lasts until the strike is completed.

This observation is based upon work with the above mentioned genera in captivity. I have seen three examples of the keeled-scaled spitting cobra, *Hemachatus haemachatus* (Lacepede), spit and have observed them closely. This is a very small number upon which to draw conclusions, but coupled with the information of others I feel no restraint in assuming that their actions were the same as others of the species.[1] However, in view of the comparatively small number of *Naja naja* (Linnaeus) which I have seen spit, the following information is given with the knowledge that out of about 20 Indian Cobras only three were observed to spit.

1st. While cleaning the cage of an Indian cobra *N. naja* from Northern Assam, it started to charge me from the far corner, I lifted a piece of white cloth so the snake would see the cloth and not me, and thus not strike while I was working. Just as I moved the cloth into position the snake struck, and hearing the sound which I have heard in the past from *H. haemachatus,* I looked at the cloth to see if it had indeed spit. I have used the scientific name *N. Sputatrix* Boie for this color phase and so I suspected that it might spit. I found on looking that the cloth was covered with venom over an area about 2 inches wide at the top and wider at the bottom, from the upper two thirds to the bottom it was noticeably sprinkled. I tasted the substance and found that it had the characteristic taste of cobra venom, but I was not able to collect enough to inject into a laboratory animal for a test. I have tasted small amounts of cobra ven-

om before, and I was sure of that reaction. It must be said that the venom was not in two streams at the start as is usually reported of the spitting cobras.[2] I did not see the snake strike, nor did I see the tilt of the head as it struck, but only heard the sound and saw the venom. Speculation as to the use of only one fang is open. I asked the natives about this species and was told that when one tries to kill the snake it will spray fluid into the face of the tormentor. English planters in the area know nothing of its habits.

2nd. This was a four foot *Naja naja* which was captured in the Sunderbans South of Calcutta. I had the snake out in the yard to take some pictures. I advanced my foot, protected by long pants and heavy shoes, to within striking distance. The snake would then pose for a short time. After doing this several times it stood up and spread, but not as much as usual. Again I advanced my foot. This time the snake struck with a sharp hiss, and there were two lines of venom on my pants leg. I again tasted this and found that it apparently was venom. I saw the snake strike, but not in the usual way of the spitting cobras, but rather in a way which I have seen many times in the cobras from this area. In striking they tilt the head back until the under side of the head is uppermost, then they come forward almost with a snap. I usually fear for the life of the snake when it strikes like that, so sharp is the jerk. I suggest that this has a possible two-fold use, because if the snake dribbles any venom, the gust of exhaled air at the same time would almost surely expel the material, and the fangs if they strike really go in deep. This method is not used to my knowledge on their food. I have seen it used on wild rats placed in the cage with a cobra, and although the rats soon die the snakes do not eat them, probably having killed in fear and not for food.

3rd. This occurred in Long Beach while cleaning one of the cobra cages. These snakes, *N. naja* were also from the south of Calcutta and two of them were spreading their hoods in the far corner of the cage. They were well out of range of me so I was not keeping too close an observation of them. I watched one which was still coiled up in front of me and tried not to disturb him as I worked. Those in the far corner struck at me several times but I did not look their way. Finally one of them struck again and a spray of venom hit me on the left side of the face. I wear glasses and some of it was on the lens. I did not see the snake strike or see if there were two streaks of venom on me. I washed my face and eye in tap water and went back to cleaning the cage. About two or three minutes later I had a feeling of scraping on the eyelid, almost as if there were sand in the eye. I knew that it was venom and I called Mrs. Grace Wiley and told her that the cobra spit venom in my eye. We washed it out again with distilled water and flushed the eye thoroughly. The skin around the eye became distended with fluid, but no blood; the eyelid was swollen enough to make movement uncomfortable. Apparently enough venom drained into the tear duct to cause a reaction on the nasal membrane, for almost immediately following the reaction of

the sensation of sand on the eyelid, I noticed a congestion of the nasal mucosa of the left side. This increased, but upon the application of heat it gradually disappeared. The reaction affecting the mucosa was preceded by sneezing, probably caused by the irritation.

Bogert reports that Shaw and Shebbeare, whose paper I do not have, in their discussion of the cobras in Bengal and Sikkim stated that "the snake ejects drops of venom, or a spray." Bogert adds that "there is nothing at all in the accompanying text to indicate that this was observed in local snakes."[3] Ridley, Quoted by Boulenger states that the cobra spreads and "makes a very curious snorting noise. . . . .spitting it's poison at its opponent."[4] Prater states that cobras are able to "spit out venom, but unless exceedingly aggravated they do not practice this habit."[5]

I have seen the African keeled-scaled cobra spit many times, and I have seen the Asiatic cobra spit that one time at my pants leg. There is a great difference in the position of the head during spitting, plus the fact that the Indian cobra must apparently be much irritated before it will either resort to dribbling venom, or spitting.

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A Young Herpetologist Writes:

"One thing that I shall never understand is how people can 'murder' snakes so feverishly. Just today I saw a boy of my age smashing a garter snake. He was laughing and so were the other children around him—they were throwing rocks at it. When I asked him 'why,' he told me, as others have, that he 'just didn't like it.' Many people think that a snake's tongue can kill you and that all snakes are poisonous, or like myths. I think that it is this ignorance of reptiles that prompts people to kill. Many a young child has fearlessly picked up snakes, but, as soon as they are old enough to understand their parent's story, they have a dreaded fear of all reptiles." Charles Blinderman, Bronx, New York.

Nature Magazine for May, 1945, p. 266 carries this statement:" . . . the snake would strike with its ominous but harmless tongue. . ." The words "strike" and "ominous" would be remembered by the public whereas the qualification "but harmless" would be forgotten. It is such irresponsible statements as this that help cause the condition mentioned by Mr. Blinderman.—Ed.

Calcified Cartilage in Reptiles

By Hobart M. Smith

The general occurrence in reptiles of calcified cartilage, instead of hyaline or other types of cartilage such as are usually found in vertebrates, has not to my knowledge received attention from comparative histologists.

In the Chondrichthyes all the skeleton consists of cartilage, but in most other adult vertebrates only a small part of the skeleton is composed of it. Parts of the cranium, the tracheal rings, the hyobranchial skeleton, the ends of the ribs and parts of the girdles are the chief structures which remain cartilaginous in adults. Some of these elements (tracheal rings, larynx) are ebony or calcified in some birds, but in other groups of vertebrates they remain cartilaginous. It has generally been considered that the cartilage, where it occurs, is hyaline, elastic or fibrous in character, rarely calcified. In fact only in elasmobranch fishes* has calcified cartilage been observed to occur commonly. Accordingly the discovery that it is the typical kind of cartilage in most reptiles is of considerable interest.

It is well known that "Alizarin Red S" is a specific stain for calcium-impregnated structures. This affinity has led to the adoption of special techniques for preparation of vertebrate skeletons for gross study. By these methods the flesh is rendered relatively clear by infiltration with glycerin, and thus the bones, which are stained bright red with alizarin, are clearly visible. Such techniques* have been of very great value in the study of small skeletons, which respond to them better than large skeletons and which are not easily prepared for study by other methods. The alizarin red stain has been supplemented by another, toluidine blue, which generally has a greater affinity for cartilage than for any other tissue, although all connective tissues absorb the stain rather well.

Since calcium is a characteristic element in bone, and is rarely found concentrated elsewhere in the body, the alizarin red stain theoretically complements perfectly the toluidine blue stain, for these two together should so stain the skeletal system that both cartilaginous and bony parts are clearly differentiated from each other and from other tissues. Likewise, alizarin red used alone should stain the bony portion only of the skeleton, and toluidine blue the cartilaginous portion only.

It follows that in most vertebrates—those lacking calcified cartilage—the effects of the two stains upon the two histological types of skeleton are mutually exclusive. Most fishes, urodeles, anurans, and mammals respond in the expected manner to the double-stain technique. In reptiles, however, most cartilage stains much like bone, and it is this fact that leads to the assumption that it is calcified. It is not bone, for even in gross appearance the stained cartilage, by its peculiar granular character, is seen to differ markedly from bone.

In skeletons of various species of snakes and lizards examined, the tracheal rings, larynx, hyobranchium, ventral ends of ribs, sternum, part of the epicoracoids, suprascapulae, and the hypoischia—all cartilaginous structures—are stained red and therefore calcified. Only a few cartilaginous structures fail to stain with alizarin red: the chondrocranium, part of the epicoracoids, and the epiphyses and symphyses of the appendicular skeleton.

Among the reptiles stained skeletons of only snakes and lizards have been examined. Whether a similar calcification occurs in other groups of reptiles is not known.

Some degree of parallelism between birds and reptiles is apparent in the calcification of the tracheal structures. It is possible that the similarity of the animals in this respect is a reflection of their common ancestry. No adult birds stained by the alizarin red technique have been observed, but it is possible that the parallelism extends to more structures than merely those of the tracheae.

The histology of reptilian calcified cartilage is not well known. A comparative study of vertebrate cartilage, particularly in birds and reptiles, should reveal some interesting facts and correlations not now evident, and should be well worth further pursuit.

SUMMARY

As indicated by reaction to alizarin red, most of the cartilaginous skeleton of lizards and snakes, exclusive of the chondrocranium, is calcified. In only one other group of vertebrates, the elasmobranch fishes, is cartilage known to be extensively calcified.

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